Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (ENVIRONMENTAL ENGINEERING)

END SEMESTER EXAMINATIONS, 2023-24

SUBJECT: ADVANCED TREATMENT OF WATER AND WASTEWATER **[CIE – 5118]**
REVISED CREDIT SYSTEM
(/ /2023)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:
- Answer **ALL** the questions.
- Missing data, if any, may be suitably assumed.

Q No		Marks	CO	BT
1A	Discuss the tests used for measuring the organic content of a water sample and elaborate on the calculation of TOC and ThOD, providing an illustrative example.	**05**	**CO1**	**3**
1B	Illustrate the treatment of municipal wastewater having high levels of suspended solids, organic matter and herbicides using a flow chart.	**05**	**CO2**	**3**
2A	Determine the BOD_1 and ultimate BOD of a wastewater whose BOD_5 at 20°C is 200 mg/l. The reaction rate constant k (base e) is equal to $0.23d^{-1}$ and $\Theta = 1.047$. Also find BOD_5 of sample at 25°C.	**05**	**CO2**	**3**
2B	Design a rectangular sedimentation tank for treating sewage from a city having maximum daily water demand of 8 MLD. Assume a detention time of 1.5 hours, SOR as 40 $m^3/m^2/d$ and horizontal flow velocity as 0.22 m/minutes. Assume 85% of water supplied will become sewage. Calculate weir loading rate.	**05**	**CO3**	**4**
3A	A single stage trickling filter is designed for an organic loading of 10,000 kg of BOD in raw sewage per hectare metre per day with a recirculation ratio of 1.5. The filter treats of flow of 6 MLD with BOD concentration in the influent as 300 mg/l. Determine the strength of the effluent. PST removes 25 % of BOD from raw sewage.	**05**	**CO3**	**4**
3B	Design a gravity thickener for an STP having the following primary and activated sludge characteristics. Assume the solids loading rate as 50 $kg/m^2.d$.	**05**	**CO3**	**4**
4A	Explain the operation of various types of Grit chambers using clear illustrations.	**05**	**CO3**	**3**

	Primary sludge	Activated sludge	Combined sludge
Specific gravity	1.03	1.004	1.02
Solids, %	3.2	0.23	
Flowrate, m3/d	250	2500	

P.T.O.

4B	Describe the working of an activated sludge process with a neat sketch. Also discuss the major design and operational parameters of ASP	**05**	**CO4**	**3**
5A	Illustrate biological phosphrous removal in wastewater treatment plant using a neat sketch.	**05**	**CO5**	**3**
5B	Explain with the neat sketch the modified solids flux analysis method used for the design of secondary clarifier	**05**	**CO5**	**3**